[c3]

[c4]

[c5]

1. A method of multi-slice fast spin echo image acquisition with black-blood contrast comprising:

applying a non-selective inversion pulse;

applying a re-inversion pulse that is slice-selective over a region encompassing a plurality of slice selections;

timing execution of a series of RF excitation pulses with fast spin echo readout such that signal from blood is near a null point; and acquiring data for the plurality of slice selections.

- [c2] 2. The method of claim 1 wherein the plurality of slice selections include all slice selections in a slab to be imaged.
 - 3. The method of claim 1 wherein the images are acquired over more than a single breath-hold.
 - 4. The method of claim 1 wherein the re-inversion pulse is applied over a region having all slice selections in a slab and data are acquired for all slice selections in the slab using a single re-inversion pulse.
 - 5. The method of claim 1 further comprising creating the inversion pulse with slice thickness given by:

 slice thickness = $(Z_1 Z_n) + 4 * opslthick$,

 where Z_1 and Z_n represents spatial locations of first and last slices selected for imaging, and opslthick represents a desired imaging slice thickness.
- [c6] 6. The method of claim 5 further comprising creating the re-inversion pulse with a center centered about a midpoint between Z and Z n
- [c7] 7. The method of claim 1 wherein the timing step includes selecting an inversion time TI such that the null point of the blood occurs near a center of the multi-slice acquisition.
 - 8. The method of claim 1 further comprising modifying a flip angle of RF excitation pulses executed before and after an occurrence of the null point of the blood to improve blood suppression.

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[c9]

9. The method of claim 8 further comprising modifying the flip of RF excitation pulses occurring before the null point to slightly less than 90° and those occurring after the null point to slightly more than 90°.

(c10) (23) 10, A computer program for multi-slice coverage in a single acquisition with black-blood T 2 -weighted image contrast, the computer program having a set of instructions that when executed by a computer cause the computer to: generate and cause application of a non-selective inversion RF pulse to a slab of slices each having a predefined thickness;

generate and cause application of a slice-selective re-inversion RF pulse having a slice thickness greater than the predefined thickness of a single slice;

apply an inversion time so that a null point of blood within the slab occurs in a middle of an acquisition segment;

apply a series of RF excitation pulses; and acquire MR data for each slice in the slab.

[c11]

11. The computer program of claim 10 wherein the slice thickness of the re-inversion pulse is selected greater than the slab of slices to allow for cardiac motion between the application of the slice-selective re-inversion RF pulse, and the acquisition of MR data.

12. The computer program of claim 10 wherein the RF excitation pulses have a flip angle greater than 90 ° for segments after the null point and less than 90 ° for segments before the null point.

[c13]

13. The computer program of claim 10 wherein the sequence is applicable over one or more R-R intervals.

[c14]

14. The computer program of claim 10 wherein the MR data is acquired during mid-diastole of an R-R interval.

[c15]

15. An MR apparatus to produce consistent contrast in FSE image acquisition comprising:

July G5

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF

signals to an RF coil assembly to acquire MR images; and

a computer programmed to apply a pulse sequence having:

a non-selective inversion pulse to invert spins in a longitudinal direction across an entire slab of slices;

a slice-selective re-inversion pulse having an implied width at least as large as that of the non-selective inversion pulse; and

a series of excitation pulses having fast spin echo readout spaced apart from the slice-selective re-inversion pulse by an inversion time to acquire data for each slice in the slab.

[c16]

16. The MR apparatus of claim 15 wherein the slice-selective re-inversion pulse of the pulse sequence is further defined as having a width greater than that of the non-selective inversion pulse to extend on either side of the non-selective inversion pulse.

[c17]

17. The MR apparatus of claim 16 wherein the slice-selective re-inversion pulse extends approximately twice the nominal slice thickness on either side of the non-selective inversion pulse.

[c18]

18. The MR apparatus of claim 15 wherein the inversion time of the pulse sequence is selected such that blood signal is close to a null point.

M[c19] \ \V

19. The MR apparatus of claim 18 wherein the series of excitation pulses have therein excitation pulses with differing flip angles.

[c20]

20. The MR apparatus of claim 19 wherein excitation pulses occurring near a mid-point of the series have a flip angle near 90° and excitation pulses occurring before a mid-point have a flip angle less than 90° and excitation pulses occurring after the mid-point have a flip angle more than 90°.

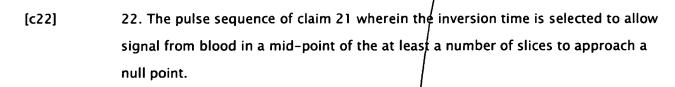
[c21]

21. A pulse sequence for use in multi-slice MR data acquisition comprising:

a non-selective inversion pulse applicable to a slab of slices;

a slice-selective re-inversion pulse applicable to at least a number of slices in the slab of slices; and

a series of fast spin echo readout excitation pulses applicable to the at least a number of slices in the slab of slices after an inversion time.



- 23. The pulse sequence of claim 21 wherein the at least a number of slices [c23] includes all slices in the slab of slices.
- [c24] 24. The pulse sequence of claim 21 wherein the at least a number of slices includes fewer slices than those in the slab of slices but more than one.
- 25. The pulse sequence of claim 21 wherein the at least a number of slices [c25] includes more slices than those in the slab of slices.
- [c26] 26. The pulse sequence of claim 21 wherein the non-selective inversion pulse has a thickness given by: slice thickness = $(Z_1 - Z_1) + 4 * opslthick$ where Z_1 and Z_n represents spatial locations of first and last slices selected for imaging, and opsithick represents a desired imaging slice thickness.
 - 27. The pulse sequence of claim 26 wherein the slice-selective re-inversion pulse has a center centered about a mid-point between Z $_1$ and Z $_n$.
 - 28. The pulse sequence of claim 21 wherein the\series of fast spin echo readout excitation pulses have varying flip angles.
 - 29. The pulse sequence of claim 28 wherein excitation pulses that occur before a mid-point of the series have a flip angle of less than 90°, those near the midpoint have a flip angle near or at 90°, and those that occur after the mid-point have a flip angle greater than 90°.

[c29]